to denote 'a series of rocks' or an 'interval in the time-scale.' In any case, the name Bradfordian is well known to students of European Mesozoic rocks, having been proposed by Desor in 1859, for Upper Bathonian rocks, as exemplified at Bradford-on-Avon in England. Dr. Girty doubtless overlooked this, although he might have found it in Professor Renevier's valuable 'Chronographe géologique' published by the International Congress of Geologists.

It is always a pity when the names of well-known European places are applied by geologists to newly established stratigraphical divisions in other countries. Instances of this, both in the British colonies and in the United States of America, are perplexingly numerous. Even such terms as 'Cussewago' and 'Cuyahoga' are to be preferred.

F. A. B.

SPECIAL ARTICLES.

NOTES ON FLUORESCENCE AND PHOSPHORESCENCE.

THE phosphorescent and fluorescent properties of natural minerals have attracted considerable notice and some highly interesting papers have been recently written on the subject, but artificial products of this class do not appear to have claimed much attention.

It is well known that minerals found in one locality may fluoresce brightly under suitable excitation, while other specimens, apparently similar, but taken from another locality, may be unresponsive under a like excitation.

It is also well known that a minute trace of certain substances, when properly incorporated with a large quantity of another substance, will sometimes impart fluorescent and phosphorescent properties to the latter. For example, if a trace of manganese chloride is fused with sodium chloride, the latter will fluoresce red under ultra-violet light, whereas sodium chloride fused by itself will show no color fluorescence. It, therefore, appears altogether probable that the fluorescent properties of some natural minerals is due to the presence of another substance in minute quantity, and in the absence of this constituent an otherwise similar mineral may be non-fluorescent.

The writer having given some study to the artificial production of fluorescent and phosphorescent compounds, is tempted to present a description of a few simple experiments in the hope that their results may prove interesting to other investigators, and thus lead to further developments in this fascinating field of research.

The ultra-violet light used for testing was made by a small high-tension arc produced by a condenser discharge between two iron balls about one half inch in diameter, the air gap being adjustable and the condenser being charged by an alternating current of 60 cycles and 120 volts, stepped up to about 5,000 volts.

Experiment No. 1.—Zinc sulphate was dissolved in a small quantity of distilled water holding a trace of manganese sulphate in solution. The mixture was boiled to dryness and then calcined at a full red heat in a porcelain crucible for about thirty minutes. The resulting white powder fluoresced a light pink and phosphoresced an intense red, having the appearance of being *red hot*.

Experiment No. 2.—Zinc chloride was dissolved in a small quantity of distilled water holding a trace of manganese sulphate in solution. An equal quantity by measure of soda silicate of a syrupy consistency was then added and the mixture triturated to a thick cream. It was then dried and calcined at a full red heat in a porcelain crucible for about three hours. The resulting white powder showed a light green fluorescence and phosphoresced brightly the same color.

Experiment No. 3.—Substituting cadmium chloride for zinc chloride, but otherwise using the same ingredients and treatment as described in the last experiment, the resulting white powder fluoresced a light pink and phosphoresced an orange yellow.

Experiment No. 4.—Cadmium sulphate was dissolved in distilled water with a trace of manganese sulphate, evaporated to dryness and calcined at a red heat in a porcelain crucible for fifteen minutes. The resulting powder fluoresced a dull yellow, and phosphoresced a light green. The phosphorescence of

TABULATED RESULTS OF EXPERIMENTS WITH FLUORESCENT AND PHOSPHORESCENT COMPOUNDS.

Material.	By Natural Light.	By Ultra-violet Light.		By Roentgen Rays.	
		Fluorescence.	Phosphorescence.	Fluorescence	Phosphorescence.
Experiment No. 1.	White.	Light pink.	Dark red.		
" " 2.	"	Light green.	Bright green.	Green.	Faint green.
" " 3.	"	Light pink.	Orange yellow.	Faint orange.	None.
" " 4.	Yellowish.	Brownish-yel.	Light green.	Greenish-yel.	Very faint.
Powdered Calcite.*	White.	Bright pink.	Intense red.	Faint red.	Very faint.
" Willemite.*	Greenish-white.	Vivid green.	Faint green.	Bright yellowish green.	Very faint green.

this product was remarkable for its persistency.

The product of experiment number 2 is, in part, a silicate of zinc which somewhat resembles willemite in the color of its fluorescence, but it differs from willemite in being intensely phosphorescent. It is worthy of notice that without the trace of manganese the resulting zinc silicate will show no fluorescence nor phosphorescence, in this respect resembling the non-fluorescent specimens of willemite. An inference may be drawn from this fact as to one of the probable causes of the brilliant green fluorescence of the willemite found in Franklin, N. J.

W. S. ANDREWS.

SCHENECTADY, N. Y.,
December 29, 1903.

PALEONTOLOGICAL NOTES.

PLEUROCŒLUS VERSUS ASTRODON.

IN the *Annals of the Carnegie Museum*, Vol. II., p. 12, Mr. Hatcher reaches the conclusion that the dinosaurian genera *Pleurocœlus* and *Astrodon* are identical, and that *Astrodon*, having priority, should stand; furthermore, Mr. Hatcher concludes that *Pleurocœlus* may be the young of some larger species. Both of these conclusions are, it seems to me, open to doubt. The vertebræ and foot bones ascribed to *Pleurocœlus* greatly outnumber all the other vertebrate remains obtained from the vicinity of Muirkirk, Md., the locality where most of the vertebrates of the Potomac formation have been collected. The small, slender, cylindrical, blunt-pointed teeth supposed to be those of *Pleurocœlus* also outnumber all other teeth found in the Potomac formation, so that there is good reason to believe the identification to be correct. The type of *Astrodon* was an imperfect, large tooth, thrice the size of any ascribed to *Pleurocœlus*, and not over four of these teeth have been discovered, while there are none of intermediate size between the two. A section of a tooth of *Pleurocœlus* shows that the enamel is proportionately much thicker than in the tooth of *Astrodon* figured by Leidy, and while this may be partly due to a difference in the planes of the respective sections this evidence is proffered for what it is worth. Finally, it may be said that no large vertebræ or foot bones similar to those of *Pleurocœlus* have as yet come to light, so that for the present it would seem well to accept the validity of this genus.

* From Franklin, N. J.

THE ARMOR OF ZEUGLODON.

THERE is such a determined effort nowadays to derive the whales from armored ancestors and to foist a shield and buckler upon *Zeuglodon* that it requires some courage to suggest that at present there is no good *evidence* that either of these theories is correct. If any living cetaceans carry with them traces of armor, it seems strange that no partly armored form has come to light among the abundant cetacean remains found in Miocene deposits. As for *Zeuglodon* (*Basilosaurus*), the only armor that undeniably belongs to this animal consists of a few, somewhat pyriform, slightly keeled ossicles, the largest somewhat greater than a man's fist. There are two of these in the collection of the U. S. National Museum and no other traces of armor have been found, either by Dr. Andrews in Egypt, or by Mr. Schuchert in the southern states. There is no reason to suppose that the irregular fragment in the Koch collection, fig-